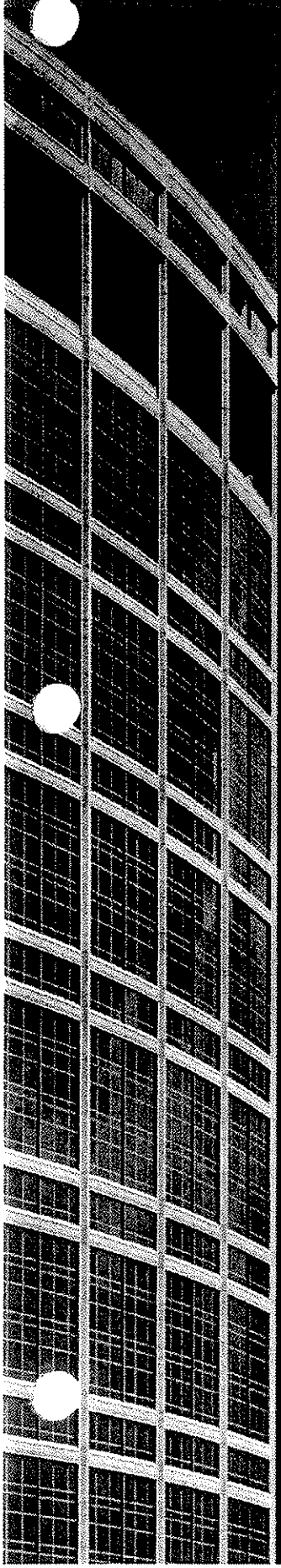
VIRACON

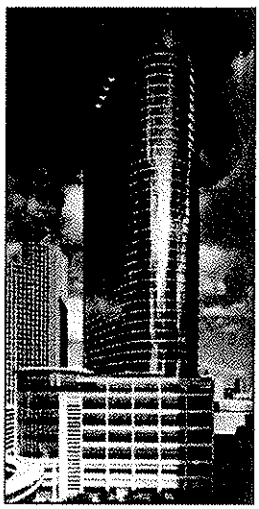


Superwindow™ insulating glass

specs & tech

solving two problems with one super idea

It all starts with taking your "what if" questions and turning them into "why not" answers. Chances are, we've recommended a solution for a similar job over the past 35 years. And chances are today, we can give you a point of view other fabricators just don't feel comfortable talking about. Trust, confidence, peace of mind — it's what insulating experience, a broad selection of glazing options and the technical expertise to fabricate customized solutions can do for you. You'll also find a wide selection of insulating glass using tints and high-performance coatings to help achieve specific designs, low radiant heat-transmission levels and the solar control options you're looking for. After all, the last thing we want is for you to have to make design changes that compromise your vision. And your clients'. It's simple: when it comes to working with you on extreme insulating glass ideas, we know the climate. Challenge us, you'll see.



1500 Louisiana Street

Houston, TX

Architect: Cesar Pelli & Associates Inc.

Glazing Contractor: Haley Greer

Photographer: Wes Thompson

From imaginative aesthetics to strict environmental and energy issues to critical budget requirements, we know how to help you figure out a way to make it all work. That's what being a leader is all about. Architects, designers, contractors and visionaries throughout the world have come to rely on our proven experience to make Viracon their "go to" company when it comes to exploring options. And getting answers. The fact is, after 35-plus years, 100,000 buildings and 500,000,000 square feet of glazing installed in some of the world's most remarkable buildings, you learn a thing or two about what's the best thing to do. Today, we perform more glass fabricating processes at a single site than any other fabricator. Sit down, tell us your thoughts, challenge us. The sky's the limit.

viraconsulting™

FIELD SALES REPRESENTATIVES
We're here to help with design assistance, budget costing, return on investment costing, spec writing and review as well as act as a liaison between architects and glazing contractors. We also work closely with the glazing contractor to offer assistance with initial costs, final pricing negotiations, product information and job site inspections. Just ask.

ACCOUNT REPRESENTATIVES & CUSTOMER SUPPORT
Call on us to help with quoting, product performance data, pricing, project coordination, samples and mockups. All it takes is a phone call.

techelp

Need an answer—fast? Our Architectural Technical Services group, along with our Architectural Design group, can assist you with specification and design assistance, performance and environmental analyses, structural calculations, energy payback, hurricane requirements and security threat levels. No problem.

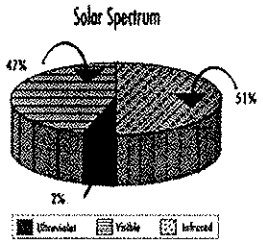


Figure 1

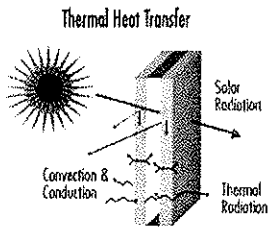


Figure 2

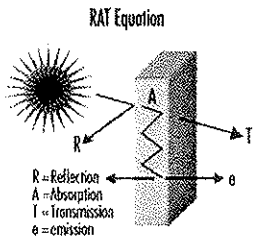


Figure 3

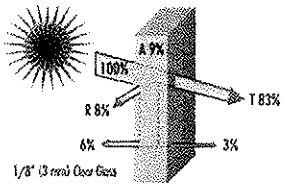


Figure 4

TERMS AND DEFINITIONS

Solar Spectrum

The solar spectrum, commonly referred to as sunlight, consists of ultraviolet light (UV), visible light and infrared (IR). The energy distribution within the solar spectrum is approximately 2 percent UV, 47 percent visible light and 51 percent IR (see Figure 1). One aspect of the solar spectrum is its wavelength in which nanometer (nm) is the unit of length [1 nm = 10^{-9} m].

UV is invisible to the human eye and has a wavelength range of ~300 - 380 nm. The damaging effects on long-term UV exposure results in fabric fading and plastic deterioration.

Visible light is the only portion of the solar spectrum visible to the human eye. It has a wavelength band of ~380 - 780 nm.

IR is invisible to the human eye, has a wave-length range of ~790 - 3000 nm and has a penetrating heat effect. Short-wave IR converts to heat when it is absorbed by an object.

Heat Transfer Methods

Heat transfers from one place to another via convection, conduction or radiation. Convection occurs from the upward movement of warm, light air currents. Conduction occurs when energy passes from one object to another. Radiation occurs when heat is sent through space and is capable of traveling to a distant object where it can be reflected, absorbed or transmitted (see Figure 2).

Solar Energy

When solar energy meets glass, portions of it are reflected, absorbed or transrnitted---giving you the RAT equation (see Figure 3).

RAT Equation

The RAT equation accounts for 100 percent of solar energy, which is equal to the sum of solar reflectance, absorption and transmittance. For example, with a single pane of 1/8" (3 mm) clear glass, 83 percent of solar energy is transmitted, 8 percent is reflected and 9 percent is absorbed by the glass. Of the solar energy absorbed, portions are emitted back towards the exterior and towards the building interior (see Figure 4).

Solar Control

The visible light and IR portions of solar energy are an essential part of sunlight, since they represent nearly 100 percent of the solar spectrum. As a result, each plays an important role when glass is selected as a glazing material for commercial building applications. To enhance thermal performance, thin metallic films are applied to one or more glass surfaces.

Solar Reflective Coatings

Solar reflective coatings reduce solar heat gain through higher reflection and absorption with the glass appearing mirror like. Typically, the coating reflects and absorbs high amounts of visible and IR portions of the solar spectrum. As a result, heat gain is dramatically reduced, but the trade off is lower light transmission through the glass.

Low-Emissivity Coatings (Low-E)

Low-emissivity coatings, which are applied to glass, reflect invisible long-wave infrared or heat. They reduce heat gain or loss in a building by redirecting the heat. In addition, they provide greater light transmission, low reflection and reduce heat transfer.

Condensation Formation

Condensation forms on glass when the glass temperature falls below the dew-point of the air. To prevent condensation from forming, the glass temperature needs to be higher than the dew-point of ambient air. That's why it is critical to choose a glass product that addresses these concerns, such as insulating glass.

For instance, insulating glass units decrease the potential for condensation formation on roomside glass surfaces by "insulating" the inboard glass ply from conductive/convective heat loss to the outside.

This "insulation", using an air space between the two glass plies, results in a more stabilized interior glass temperature. Unfortunately, insulating glass alone may not totally eliminate condensation formation in extreme climates. To lessen this risk, a low-e coating can be applied to the insulating unit.

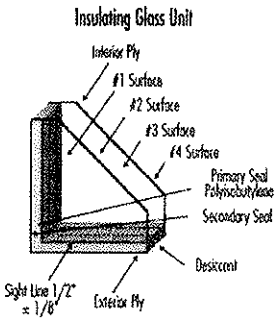


Figure 5

Insulating Glass

Inherently, insulating glass increases a window's thermal performance. It is constructed with two or more glass plies, separated by a desiccant-filled spacer and sealed with an organic sealant. The desiccant absorbs the insulating glass units internal moisture.

Viracon uses mill finish and black painted spacers. We also offer a stainless steel spacer for warm edge performance (see Figure 5).

Viracon's insulating glass products offer a wide range of performance levels, as well as aesthetic options.

VIRACON'S GLASS

Viracon's Superwindow™ Insulating Glass

This glass type incorporates two different coatings. It features a high-performance reflective coating on the number two surface and a Low-E coating on the number three surface (see Figure 6). By applying two coatings, Superwindow insulating glass offers low solar transmission and low radiant heat transmission.

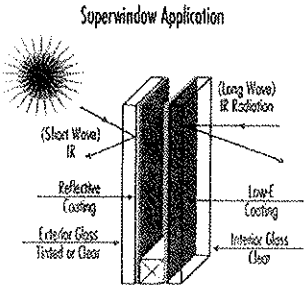


Figure 6

In addition, a Superwindow insulating glass unit offers a low shading coefficient and U-value, making it more energy efficient than a standard reflective insulating glass unit.

These performance characteristics make it an excellent product choice for areas that experience unusual seasonal climatic variations. The construction of a Superwindow insulating glass unit allows the interior temperature to remain consistent, providing a more comfortable building interior environment.

Vision/Spandrel Match

Often a project may require spandrel glass to harmonize with the vision areas of your building. However, this is sometimes difficult to achieve when high-light transmitting or low-reflective glass types are used. Instead, the use of low-light transmitting and high-reflective glass types provide the least contrast between vision and spandrel areas under a variety of lighting conditions.

In addition, variable sky conditions can also influence our perception of glass color and general appearance. On a bright, sunny day, the exterior light intensity is approximately 50 to 100 times greater than the interior lighting level. When viewing the glass from the outside, the dominant visual characteristic is the exterior reflection.

On gray, overcast days, a greater visual disparity is created between vision and spandrel areas. This is due to the transparency of the vision glass and the perception of depth created by interior lighting. The non-vision areas tend to look flat and two-dimensional by contrast.

Because spandrel glass is virtually opaque, it can only be viewed in reflection. On the other hand, vision glass possesses a degree of transmission. As the transmission of the vision glass increases during overcast conditions, interior lighting becomes more prevalent.

Viracon recommends viewing glass samples or full-size mockups to match vision and spandrel glass areas when the vision glass light transmission exceeds 14 percent.

Greater contrast between vision and spandrel areas occurs when using uncoated, tinted glass (green, bronze, blue, etc.) or high transmission, Low-E coatings. Under these conditions, insulating spandrel units can create the illusion of depth and approximate the vision glass more closely.

By keeping the vision and spandrel glass construction similar (the same exterior glass color, coating, etc.), the contrast can be minimized under various lighting conditions. Viracon recommends a neutral colored ceramic frit on the number four surface.

ENERGY TERMS

Visible Light Transmittance

The percentage of visible light (380 - 780 nm) that is transmitted through the glass.

Solar Transmittance

The percentage of ultraviolet, visible and near infrared energy (300 - 3000 nm) that is transmitted through the glass.

Visible Light Reflectance

The percentage of light that is reflected from the glass surface(s).

Solar Reflectance

The percentage of solar energy that is reflected from the glass surface(s).

NFRC U-Value

A measure of heat gain or heat loss through glass due to the differences between indoor and outdoor temperatures. These are center pane values based on NFRC standard winter nighttime and summer daytime conditions.

U-values are given in BTU/(hr*ft²*°F) for the English system. Metric U-values are given in W/(m²*°K). To convert from English to metric, multiply the English U-value by 5.6783.

NFRC winter nighttime U-values are based on an outdoor temperature of 0°F (-17.8°C), an indoor temperature of 70°F (21°C) and a 12.3 mph (19.8 km/h) outdoor air velocity.

NFRC summer daytime U-values are based on an outdoor temperature of 89°F (32°C), an indoor temperature of 75°F (24°C), a 6.2 mph (10.1 km/h) outdoor air velocity and a solar intensity of 248 BTU/(hr*ft²*°F) (782 W/m²).

R-Value

Thermal resistance is expressed in ft²*hr*°F/BTU. It is the reciprocal of U-value. The higher the R-value, the less heat is transmitted through the glazing material.

Shading Coefficient

Shading coefficient is the ratio of solar heat gain through a specific type of glass that is relative to the solar heat gain through a 1/8" (3 mm) ply of clear glass under identical conditions (see Figure 7). As the shading coefficient number decreases, heat gain is reduced, which means a better performing product.

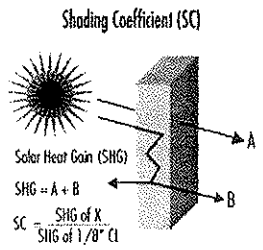


Figure 7

Relative Heat Gain (RHG)

The amount of heat gained through glass taking into consideration U-value and shading coefficient. Using the NFRC standard, relative heat gain is calculated as follows:

English System:
RHG = Summer U-value x 14°F + shading coefficient x 200.
Metric System:
RHG = Summer U-value x 7.8°C + shading coefficient x 630.

Solar Heat Gain Coefficient (SHGC)

The portion of directly transmitted and absorbed solar energy that enters into the building's interior. The higher the SHGC, the higher the heat gain.

Light to Solar Gain Ratio (LSG)

The ratio is equal to the Visible Light Transmittance divided by the Solar Heat Gain Coefficient. The Department of Energy's Federal Technology Alert publication of the Federal Energy Management Program (FEMP) views an LSG of 1.25 or greater to be Green Glazing/Spectrally Selective Glazing.

European U-Value (formerly K-Value)

Based on ISO-DP10292 draft standard conditions. It is based on an outdoor temperature of 5.5°C, an indoor temperature of 20.5°C and a 4.8 m/s outdoor air velocity.

The solar and optical data presented in this guide is center-of-glass data based on the National Fenestration Rating Council measurement standards. They were calculated using Lawrence Berkeley Laboratories (LBL) new WINDOW 5.2 software. In some cases, performance data changed in comparison to previous versions of LBL's WINDOW program.

SOLARSCREEN™ CODE CHARTS

Coating Type	Outboard Glass Substrate		Nominal Visible Light Transmittance of Coating	
VS = Stainless Steel	1 = Clear*	9 = Versalux® Blue 2000	08 = 8%	30 = 30%
VT = Titanium	2 = Green*	10 = Versalux® Green 2000*	13 = 13%	35 = 35%
VA = Antique	3 = Gray*	11 = Arctic Blue™	14 = 14%	40 = 40%
VE = Low-E	4 = Bronze*	12 = Atlantica™	18 = 18%	
VY = Crystal Chrome	5 = Blue*	13 = Starphire™	20 = 20%	
W = VE-85 #3	6 = Blue-Green*	14 = Caribia™	22 = 22%	
	7 = Azuria™*	15 = UltraWhite™		
	8 = EverGreen™			

*Detailed performance data is provided on the following pages with these glass substrates. Contact us for performance data with other glass substrates.

SOLARSCREEN STAINLESS STEEL SUPERWINDOW INSULATING GLASS (TABLE 1)

Product	Transmittance			Reflectance			U-Value		Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
	Visible	Solar	U-V	Vis-Out	Vis-In	Solar	Winter	Summer					
VWS 1-08	7%	4%	2%	42%	34%	34%	.31	.28	.12	29	.11	.66	1.6
VWS 1-14	12%	7%	3%	32%	35%	27%	.31	.28	.17	37	.14	.84	1.6
VWS 1-20	17%	10%	5%	24%	30%	21%	.31	.28	.21	46	.18	.97	1.6
VWS 1-30	25%	15%	7%	15%	27%	15%	.31	.28	.28	60	.24	1.05	1.6
VWS 1-40	34%	21%	10%	10%	23%	11%	.31	.29	.35	75	.31	1.10	1.6
VWS 2-08	6%	3%	1%	31%	34%	17%	.31	.28	.12	28	.10	.61	1.6
VWS 2-14	10%	5%	2%	25%	35%	14%	.31	.28	.15	33	.13	.76	1.6
VWS 2-20	15%	7%	2%	19%	30%	11%	.31	.28	.17	39	.15	.97	1.6
VWS 2-30	23%	11%	4%	12%	26%	8%	.31	.29	.23	49	.19	1.19	1.6
VWS 2-40	29%	13%	5%	9%	22%	7%	.31	.29	.26	56	.22	1.30	1.6
VWS 3-08	4%	3%	1%	14%	34%	15%	.31	.28	.12	28	.10	.37	1.6
VWS 3-14	6%	4%	2%	12%	34%	13%	.31	.28	.15	33	.12	.50	1.6
VWS 3-20	9%	6%	2%	10%	30%	11%	.31	.28	.17	38	.15	.59	1.6
VWS 3-30	13%	8%	3%	7%	26%	7%	.31	.29	.20	44	.17	.75	1.6
VWS 3-40	17%	11%	4%	6%	22%	6%	.31	.29	.24	52	.21	.82	1.6
VWS 4-08	4%	3%	1%	17%	34%	16%	.31	.28	.12	29	.11	.39	1.6
VWS 4-14	7%	4%	1%	14%	35%	13%	.31	.28	.15	33	.13	.52	1.6
VWS 4-20	10%	6%	2%	11%	30%	11%	.31	.28	.17	39	.15	.68	1.6
VWS 4-30	15%	9%	3%	8%	26%	8%	.31	.29	.21	47	.18	.84	1.6
VWS 4-40	21%	13%	4%	6%	22%	7%	.31	.29	.26	56	.23	.90	1.6
VWS 5-08	5%	3%	1%	19%	34%	15%	.31	.28	.12	28	.10	.45	1.6
VWS 5-14	7%	4%	2%	15%	34%	12%	.31	.28	.14	33	.12	.60	1.6
VWS 5-20	11%	6%	3%	12%	30%	10%	.31	.28	.17	38	.15	.71	1.6
VWS 5-30	16%	9%	4%	9%	26%	8%	.31	.29	.21	46	.18	.88	1.6
VWS 5-40	22%	12%	6%	7%	22%	6%	.31	.29	.25	54	.22	.98	1.6
VWS 6-08	6%	3%	1%	32%	34%	18%	.31	.28	.12	29	.11	.56	1.6
VWS 6-14	10%	5%	2%	25%	35%	15%	.31	.28	.15	34	.13	.77	1.6
VWS 6-20	15%	7%	3%	19%	30%	12%	.31	.28	.18	40	.15	.98	1.6
VWS 6-30	22%	11%	5%	12%	26%	9%	.31	.29	.23	50	.20	1.12	1.6
VWS 6-40	29%	14%	6%	9%	22%	7%	.31	.29	.27	59	.24	1.22	1.6
VWS 7-08	6%	2%	1%	27%	34%	13%	.31	.28	.12	28	.10	.56	1.6
VWS 7-14	9%	4%	3%	22%	35%	11%	.31	.28	.14	31	.12	.76	1.6
VWS 7-20	13%	5%	3%	17%	30%	9%	.31	.28	.16	36	.14	.96	1.6
VWS 7-30	19%	8%	5%	11%	27%	7%	.31	.29	.19	42	.16	1.21	1.6
VWS 7-40	26%	11%	7%	8%	22%	6%	.31	.29	.22	49	.19	1.39	1.6
VWS10-08	6%	2%	1%	26%	34%	12%	.31	.28	.12	28	.10	.55	1.6
VWS10-14	9%	4%	1%	20%	35%	10%	.31	.28	.14	32	.12	.73	1.6
VWS10-20	13%	5%	1%	16%	30%	9%	.31	.28	.16	36	.14	.93	1.6
VWS 10-30	19%	8%	2%	10%	27%	7%	.31	.29	.19	42	.16	1.18	1.6
VWS10-40	26%	11%	3%	8%	22%	6%	.31	.29	.23	49	.19	1.35	1.6

SHGC refers to Solar Heat Gain Coefficient.
LSG refers to Light to Solar Gain Ratio.

1. The performance data for Tables 1 - 4 applies to insulating glass units with two plies (clear inboard) of 1/4" (6 mm) glass and a 1/2" (13 mm) air space.
2. The high-performance reflective coating is applied to the second surface and the Low-E coating is applied to the third surface.
3. The exterior glass ply must be heat treated.
4. Contact Viracon's Technical Services Department to determine the possibility of using annealed glass (inboard).
5. The Technical Services Department can also provide information on products not listed here.

VIRACON

SOLARSCREEN ANTIQUE SILVER SUPERWINDOW INSULATING GLASS (TABLE 2)

Product	Transmittance			Reflectance			U-Value		Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
	Visible	Solar	U-V	Vis-Out	Vis-In	Solar	Winter	Summer					
VWA 1-13	13%	8%	4%	28%	35%	24%	.31	.28	.18	39	.15	.86	1.6
VWA 1-18	18%	11%	5%	22%	33%	20%	.31	.28	.22	47	.19	.93	1.6
VWA 1-22	19%	12%	6%	19%	32%	18%	.31	.28	.23	51	.20	.97	1.6
VWA 1-35	32%	20%	9%	11%	27%	11%	.31	.29	.34	72	.29	1.11	1.6
VWA 2-13	11%	5%	2%	21%	36%	12%	.31	.28	.15	35	.13	.84	1.6
VWA 2-18	15%	7%	3%	16%	33%	10%	.31	28	.18	40	.15	.99	1.6
VWA 2-22	17%	8%	3%	15%	32%	10%	.31	.28	.19	42	.16	1.03	1.6
VWA 2-35	27%	13%	5%	9%	27%	7%	.31	.29	.25	54	.22	1.24	1.6
VWA 3-13	7%	5%	2%	11%	35%	12%	.31	.28	.15	34	.13	.51	1.6
VWA 3-18	9%	6%	3%	9%	33%	10%	.31	.28	.17	39	.15	.60	1.6
VWA 3-22	10%	7%	3%	8%	32%	10%	.31	.28	.18	41	.16	.62	1.6
VWA 3-35	17%	12%	5%	6%	27%	7%	.31	.29	.25	53	.21	.79	1.6
VWA 4-13	8%	5%	2%	12%	36%	12%	.31	.28	.15	34	.13	.58	1.6
VWA 4-18	10%	6%	2%	10%	33%	10%	.31	.28	.18	39	.15	.69	1.6
VWA 4-22	11%	7%	2%	9%	32%	10%	.31	.28	.19	41	.16	.71	1.6
VWA 4-35	19%	12%	4%	7%	27%	7%	.31	.29	.25	54	.22	.86	1.6
VWA 5-13	8%	5%	2%	13%	36%	11%	.31	.28	.15	34	.13	.62	1.6
VWA 5-18	11%	6%	3%	11%	33%	9%	.31	.28	.17	38	.15	.73	1.6
VWA 5-22	12%	7%	3%	10%	32%	9%	.31	.28	.18	40	.16	.76	1.6
VWA 5-35	20%	12%	5%	7%	27%	7%	.31	.29	.24	53	.21	.95	1.6
VWA 6-13	11%	5%	2%	21%	36%	13%	.31	.28	.16	35	.14	.79	1.6
VWA 6-18	15%	7%	3%	17%	33%	11%	.31	.28	.18	41	.16	.94	1.6
VWA 6-22	17%	8%	3%	15%	32%	10%	.31	.28	.19	43	.17	.98	1.6
VWA 6-35	27%	14%	5%	9%	27%	7%	.31	.29	.26	57	.23	1.19	1.6
VWA 7-13	10%	4%	3%	19%	35%	10%	.31	.28	.14	33	.12	.83	1.6
VWA 7-18	14%	6%	4%	15%	33%	8%	.31	.28	.16	36	.14	.97	1.6
VWA 7-22	15%	6%	4%	14%	32%	8%	.31	.28	.17	38	.15	1.00	1.6
VWA 7-35	25%	10%	6%	9%	27%	6%	.31	.29	.22	47	.19	1.31	1.6
VWA 10-13	10%	4%	1%	18%	35%	9%	.31	.28	.14	33	.12	.81	1.6
VWA 10-18	13%	5%	1%	14%	33%	8%	.31	.28	.16	36	.14	.94	1.6
VWA 10-22	15%	6%	2%	13%	32%	8%	.31	.28	.17	38	.15	.97	1.6
VWA 10-35	24%	10%	2%	8%	27%	6%	.31	.29	.22	48	.19	1.27	1.6

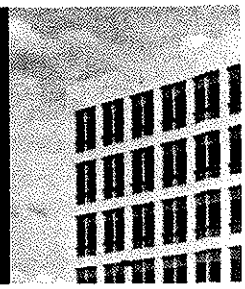
SOLARSCREEN CRYSTAL CHROME SUPERWINDOW INSULATING GLASS (TABLE 3)

Product	Transmittance			Reflectance			U-Value		Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
	Visible	Solar	U-V	Vis-Out	Vis-In	Solar	Winter	Summer					
VWY 1-08	7%	4%	2%	43%	39%	35%	.31	.28	.12	28	.10	.65	1.6
VWY 1-14	12%	7%	5%	36%	34%	28%	.31	.28	.17	38	.15	.78	1.6
VWY 1-20	17%	11%	7%	27%	31%	21%	.31	.28	.22	48	.19	.92	1.6
VWY 1-30	25%	16%	10%	22%	25%	18%	.31	.29	.29	62	.25	1.01	1.6
VWY 2-08	6%	3%	1%	33%	38%	17%	.31	.28	.12	29	.11	.55	1.6
VWY 2-14	10%	5%	3%	27%	34%	15%	.31	.28	.15	34	.13	.76	1.6
VWY 2-20	15%	7%	4%	22%	31%	12%	.31	.28	.18	41	.16	.93	1.6
VWY 2-30	21%	10%	5%	17%	24%	10%	.31	.29	.22	48	.19	1.12	1.6
VWY 3-08	3%	2%	1%	14%	39%	13%	.31	.28	.12	28	.10	.32	1.6
VWY 3-14	6%	4%	2%	12%	34%	11%	.31	.28	.14	33	.12	.48	1.6
VWY 3-20	9%	6%	3%	10%	31%	9%	.31	.28	.17	38	.15	.57	1.6
VWY 3-30	13%	9%	4%	9%	24%	8%	.31	.29	.21	46	.18	.71	1.6
VWY 4-08	4%	3%	1%	18%	39%	16%	.31	.28	.12	29	.11	.37	1.6
VWY 4-14	7%	5%	2%	15%	34%	14%	.31	.28	.15	34	.13	.53	1.6
VWY 4-20	10%	7%	3%	13%	31%	11%	.31	.28	.18	40	.15	.67	1.6
VWY 4-30	15%	10%	4%	11%	24%	10%	.31	.29	.22	49	.19	.80	1.6
VWY 5-08	4%	3%	1%	19%	38%	15%	.31	.28	.12	29	.11	.39	1.6
VWY 5-14	7%	4%	3%	17%	34%	13%	.31	.28	.15	34	.13	.55	1.6
VWY 5-20	11%	7%	4%	14%	31%	10%	.31	.28	.18	39	.15	.72	1.6
VWY 5-30	16%	10%	6%	12%	24%	9%	.31	.39	.22	47	.19	.84	1.6
VWY 6-08	6%	3%	2%	32%	38%	18%	.31	.28	.12	28	.10	.57	1.6
VWY 6-14	10%	5%	3%	27%	34%	15%	.31	.28	.15	34	.13	.75	1.6
VWY 6-20	14%	7%	4%	21%	31%	12%	.31	.28	.18	40	.16	.89	1.6
VWY 6-30	22%	11%	6%	18%	24%	11%	.31	.29	.23	50	.20	1.09	1.6
VWY 7-08	5%	2%	2%	30%	38%	14%	.31	.28	.12	28	.10	.54	1.6
VWY 7-14	9%	4%	3%	26%	34%	12%	.31	.28	.14	32	.12	.78	1.6
VWY 7-20	14%	6%	5%	20%	31%	10%	.31	.28	.17	38	.14	1.01	1.6
VWY 7-30	20%	8%	7%	15%	24%	9%	.31	.29	.19	43	.17	1.15	1.6
VWY 10-08	5%	2%	1%	26%	39%	12%	.31	.28	.12	28	.10	.49	1.6
VWY 10-14	9%	4%	1%	22%	34%	11%	.31	.28	.14	32	.12	.73	1.6
VWY 10-20	13%	6%	2%	17%	31%	9%	.31	.28	.16	37	.14	.94	1.6
VWY 10-30	19%	8%	3%	15%	24%	8%	.31	.29	.19	43	.17	1.12	1.6

VIRACON

SOLARSCREEN TITANIUM BLUE SUPERWINDOW INSULATING GLASS (TABLE 4)

Product	Transmittance			Reflectance			U-Value		Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
	Visible	Solar	U-V	Vis-Out	Vis-In	Solar	Winter	Summer					
VWT 1-20	18%	10%	4%	22%	31%	22%	.31	.28	.21	45	.18	1.01	1.6
VWT 1-30	26%	15%	6%	16%	27%	17%	.31	.28	.28	59	.24	1.09	1.6
VWT 1-40	35%	21%	8%	12%	23%	12%	.31	.29	.35	74	.30	1.16	1.6
VWT 2-20	15%	7%	2%	17%	31%	11%	.31	.28	.18	39	.15	1.03	1.6
VWT 2-30	22%	10%	3%	13%	27%	9%	.31	.28	.22	47	.19	1.16	1.6
VWT 2-40	29%	13%	4%	9%	23%	7%	.31	.29	.26	56	.22	1.34	1.6
VWT 3-20	9%	6%	2%	9%	31%	11%	.31	.28	.17	37	.14	.66	1.6
VWT 3-30	13%	9%	3%	8%	27%	9%	.31	.28	.21	46	.18	.74	1.6
VWT 3-40	18%	12%	4%	6%	23%	8%	.31	.29	.25	54	.22	.80	1.6
VWT 4-20	11%	6%	2%	11%	31%	12%	.31	.28	.17	39	.15	.74	1.6
VWT 4-30	16%	10%	3%	9%	27%	10%	.31	.28	.22	47	.19	.85	1.6
VWT 4-40	22%	13%	4%	7%	23%	8%	.31	.29	.26	57	.23	.93	1.6
VWT 5-20	11%	6%	2%	11%	31%	10%	.31	.28	.17	37	.14	.80	1.6
VWT 5-30	16%	9%	3%	9%	27%	8%	.31	.28	.21	45	.18	.89	1.6
VWT 5-40	22%	12%	5%	7%	23%	7%	.31	.29	.25	54	.21	1.03	1.6
VWT 6-20	15%	7%	2%	18%	31%	12%	.31	.28	.18	40	.15	1.03	1.6
VWT 6-30	22%	11%	3%	13%	27%	10%	.31	.28	.22	49	.19	1.17	1.6
VWT 6-40	30%	14%	5%	9%	23%	8%	.31	.29	.27	58	.23	1.29	1.6
VWT 7-20	14%	5%	3%	16%	31%	9%	.31	.28	.16	36	.14	.99	1.6
VWT 7-30	20%	8%	4%	12%	27%	8%	.31	.28	.19	42	.16	1.26	1.6
VWT 7-40	27%	11%	6%	9%	23%	6%	.31	.29	.22	49	.19	1.41	1.6
VWT 10-20	14%	5%	1%	15%	31%	8%	.31	.28	.16	36	.14	.97	1.6
VWT 10-30	20%	8%	2%	11%	27%	7%	.31	.28	.19	42	.16	1.22	1.6
VWT 10-40	26%	11%	2%	9%	23%	6%	.31	.29	.22	49	.19	1.37	1.6



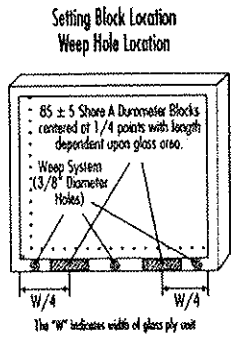


Figure 8

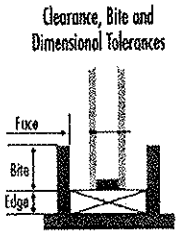


Figure 9

Glazing Guidelines

All glass plies must be supported on two silicone or silicone compatible setting blocks. The blocks should have a durometer hardness of 85±5. They should also be centered at quarter points and be 1/16" (1.6 mm) less than the channel width (see Figure 8).

Lockstrip gasket systems also require setting blocks. For additional recommendations, contact the appropriate gasket manufacturer. Inadequate edge clearances can cause glass breakage as a result of glass-to-frame contact. Viracon recommends a minimum face clearance of 3/16" (5 mm), a minimum edge clearance of 1/4" (6 mm) and a minimum glass bite of 1/2" (13 mm) (see Figure 9 to the right and see the Recommended Clearances chart on page 10).

Weep System

Do not expose the edges of laminated, insulating and opacifier film glass to standing water. This can cause premature seal failure or delamination. Viracon requires either impervious weather seals or an adequate weep system to prevent this from occurring (see Figure 10 to the right). This is also true of lockstrip gasket glazing. The glazing system manufacturer or designer is ultimately responsible for the design of the weep system and its proper performance.

Structural Silicone Glazing

Structural silicone glazing systems use silicone sealants with an interior backup mullion. It must be specified as a structural silicone glazing system due to compatibility limitations of silicone sealants with certain types of glass or insulating unit secondary seals. To obtain approval for any structural silicone glazing system, contact the appropriate silicone manufacturer or Viracon's Technical Services Department.

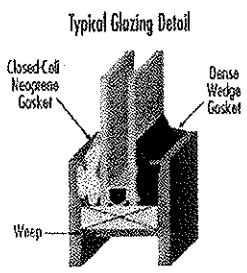


Figure 10

Gray Silicone/PIB (Polyisobutylene)

Viracon offers Gray silicone/PIB in addition to standard Black silicone/PIB sealant. Both colors of sealant are the same Dow Corning 982 structural silicone used by Viracon for the past 20 years. Therefore, the structural performance and long-term durability expected of the primary and secondary seal of our insulating glass unit remains the same.

The Gray silicone/PIB dual seal construction has certain inherent visual characteristics that are not readily apparent with a Black silicone/PIB dual seal construction. These include the following:

- Gray color variation. Given the inherent variation in compounding both silicone and PIB by suppliers, visual differences may occur.
- Color match between silicone and PIB. While every effort is made to match these visually, the compounding variation mentioned above precludes a perfect match. Additionally, a slight contrast in color is required in order to identify any sealant inconsistencies.
- Black specks within the silicone and PIB. These are due to the existence of carbon black in the sealant manufacturing process.
- Dark lines or streaks in the silicone. These may occur as a result of the edge deletion process used to remove certain coatings around the perimeter glass edge. With black silicone/PIB these are not visible; however, with the light gray color they may be visible when viewed from close distances.

None of these inherent product characteristics would be considered cause for rejection.

Glass Handling and Storage

Care needs to be taken during handling and glazing to ensure that glass damage does not occur. Do not allow glass edges to contact the frame or any hard surface during installation. Use rolling blocks if the insulating units are rotated or "cartwheeled" on their corners. To see an example of a rolling block, refer to the Glass Association of North America (GANA) glazing manual.

Improper glass storage techniques may result in damage to glass components, glass surfaces, coatings or glass breakage. Store glass crates properly to prevent them from tipping. Also, ensure proper blocking and protection from outside elements.

Viracon recommends a 5-7° lean against two wide, sturdy uprights, which are capable of withstanding crate weight.

Once the glass is installed, the architect, general contractor or building owner should provide for glass protection and cleaning. Weathering metals, alkaline materials or abrasive cleaners may cause surface damage. Windblown objects, welding sparks or other material that contacts the glass surface during construction may cause irreversible damage.

Maintenance and Cleaning

To maintain aesthetics, it is important to clean the glass during and after construction. For routine cleaning, use a soft, clean, grit-free cloth and a mild soap, detergent or window cleaning solution.

Rinse immediately with clean water and remove any excess water from the glass surface with a squeegee. Do not allow any metal or hard parts of the cleaning equipment to contact the glass surface.

Take special care cleaning coated reflective glass surfaces. Do not use abrasive cleaners, razor blades, putty knives and metal parts of cleaning equipment, since these will scratch the reflective coating. Fingerprints, grease, smears, dirt, scum and sealant residue are more noticeable on reflective glass, requiring more frequent cleaning. Follow the same cleaning techniques used for nonreflective glass.

Glass Breakage

It is important to first determine appropriate loads for the glass. Viracon can supply architects with glass strength analyses on specified products. "Unexplained" glass breakage may still occur due to thermal stress, glazing system pressures, glazing damage, handling and storage conditions, excessive wind loads, objects and debris striking the glass, improper factory fabrication or damage by persons or objects at the construction site.

Framing Deflections

Refer to the GANA glazing manual for information on adequate framing systems. You are required to comply with industry standards for framing deflection. It must not exceed either the length of the span divided by 175 or 3/4" (19 mm), whichever is less.

Non-Rectangular Glass Shapes

Viracon's capabilities include cutting virtually any shape glass required for your project without full-size patterns. However, if you require a full-size pattern, it must be submitted to Viracon on mylar material. If not, Viracon will transfer the pattern to mylar at an additional charge. However, Viracon will not be responsible for size accuracy. For additional information, contact Viracon's Inside Sales Department.

Suggested Specifications

You can specify Viracon products, using the MASTERSPEC® Basic Section "Glass and Glazing" or the MASTERSPEC Supplemental Section "Decorative Glazing" software.

MASTERSPEC is a comprehensive and unbiased master specification system produced and distributed by the American Institute of Architects (AIA) on a licensed user basis. For further information, call 800-424-5080.

Warranty Information

Viracon's architectural products carry limited warranties. Contact our Inside Sales Department for copies of our product warranties.

PRODUCT STANDARDS

Superwindow Insulating Glass

Minimum Size	Standard Maximum Size
Heat processed:	
12" x 36"	84" x 144"
(305 mm x 914 mm)	(2134 mm x 3658 mm)

Premium over-sized maximum: 84" x 165" (2134mm x 4191mm) or 96" x 144" (2438mm x 3658mm). Premium over-sized for silk-screened glass and for heat-soaked glass is 84" x 165" (2134mm x 4191mm). A technical review is required for all over-sized requests.

1. In some cases, insulating glass units may require heat processing. Refer to heat processing comments for further product information.
2. Superwindow Glass Inspection Guidelines
   - Pinholes—Inspect glass from a distance of 10 ft. (3 m) in transmission, at a viewing angle of 90° to the specimen, against a bright uniform background. If a pinhole is readily apparent, the following criteria apply: Pinholes larger than 1/16" (1.6 mm) in diameter are not allowed in 80 percent of the central glass area. Pinholes larger than 3/32" (2.4 mm) are not allowed in the outer 20 percent of the glass area. No more than two readily apparent blemishes are allowed in a 3" (75 mm) diameter circle and no more than five readily apparent blemishes are allowed in a 12" (300 mm) diameter circle.
   - Uniformity—When viewing coated glass from a minimum distance of 10 ft. (3 m), color variation may occur from one unit to another. This can be caused by variations within the float glass substrate and normal production variations, and this is not considered a defect. All Viracon commercial glass products conform to industry color standards.
   - Distortion—Various factors involved in heat processing, insulating air spacers and frame binding may distort reflected objects viewed on the glass surface. These are not considered defects of the coated glass or the final fabricated product.
   - Scratches—Inspect glass from a distance of 10 ft. (3 m). Scratches up to 2" (50 mm) are allowed in 80 percent central glass area, and scratches up to 3" (75 mm) are allowed in the outer area. Concentrated scratches or abraded areas are not allowed.

Superwindow Insulating Spandrel Glass

Minimum Size	Standard Maximum Size
12" x 36"	84" x 144"
(305 mm x 914 mm)	(2134 mm x 3658 mm)

Premium over-sized maximum: 84" x 165" (2134mm x 4191mm). A technical review is required for all over-sized requests.

1. Viracon designs its spandrel glass for glazing against a uniform, opaque background. We do not recommend its use in transoms, partitions or other areas where a uniform, opaque background is unavailable.
2. Superwindow Spandrel Glass Inspection Guidelines
   - View spandrel glass from a distance of 15 ft. (4.6 m) under natural daylight conditions. Color and reflectance may vary when viewed under a uniform, opaque background. This is not considered a defect.
   - When viewing spandrel glass under similar conditions, reflected pinholes and scratches are not considered defects if they are unobtrusive.

Heat-Processed Glass (Heat Strengthened and Tempered)

1. Glass cutting and fabrication is completed prior to heat processing.
2. Viracon's two types of heat-processed glass comply with ASTM Standard C1048. Surface compression of heat-strengthened glass with thicknesses of 1/4" (6 mm) and less is 4,000-7,000 psi. Surface compression for 5/16" (8 mm) and 3/8" (10 mm) heat-strengthened glass is 5,000-8,000 psi.* For fully-tempered glass, the minimum surface compression is 10,000 psi. It also complies with ANSI Z97.1 and CPSC 16 CFR 1201 safety glazing standards.

*Because of reader repeatability and instrument tolerances, Viracon's tolerance for heat-strengthened glass surface compression is +/- 1,000 psi.

Note: The maximum sizes listed are shown to illustrate production limits. These sizes are unavailable as finished products. Maximum piece size for annealed glass under any condition is 50 sq. ft. (4.65 sq.m.) Maximum size for heat-treated glass under any condition is 65 sq. ft. (6.04 sq.m.) Maximum unit weight is 750 pounds (340 Kg). The premium over-weight maximum is 2000 pounds (907 Kg). A technical review is required for all over-weight requests.

For more information on Superwindow insulating glass or additional literature, call 800-533-2080 or E-mail us at glass@viracon.com.

RECOMMENDED CLEARANCES

Glass Thickness	Edge Clearance	Face Clearance	Glass Bite	Dimensional Tolerance	Thickness Tolerance
1" (25 mm) Unit with 1/4" (6 mm) Glass	1/4" (6 mm)	3/16" (5 mm)	1/2" (13 mm)	+3/16"/-1/16" (4.8 mm/-1.6 mm)	+1/32"/-1/16" (.8 mm/-1.6 mm)

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E-Mail: glass@viracon.com Internet address: http://www.viracon.com

This publication describes Viracon's architectural Superwindow glass products to help you analyze possible design options and applications. To obtain warranty information, contact Viracon's Architectural Inside Sales or Technical Services Department.

The information contained in this publication is presented in good faith. It is believed to be accurate at the time of publication. Viracon reserves the right to change product specifications without notice and without incurring obligation.

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